

Barriers to transformative adaptation: responses to flood risk in Ireland

Abstract

Barriers to climate change adaptation have received increased attention in recent years as researchers and policymakers attempt to understand their complex and interdependent nature and identify strategies for overcoming them. To date however, there is a paucity of research on barriers to transformative adaptation. Using two case studies of flood risk management from Ireland we identify and characterize barriers to transformative adaptation. Qualitative semi-structured interviews were conducted with key stakeholders connected to proposed transformative strategies in Skibbereen, County Cork and Clontarf, County Dublin. Across both case studies, where transformative strategies failed to materialize, we highlight three significant barriers that impede transformation including: i) social and cultural values, particularly place attachment and identity; ii) institutional reliance on technical expertise which fails to look beyond traditional technocratic approaches and; iii) institutional regulatory practices. Findings illustrate that where social or institutional barriers emerge, transformation may more likely succeed through a series of incremental changes, which culminate in transformation. This research has practical implications for future adaptation planning as facilitating transformation through incrementalism requires flexible adaptation strategies that are responsive to changing social values over time. While focused on flood risk management, our findings have applicability for other sectors adapting to climate change.

Keywords: flood risk; barriers; transformation; incremental change; adaptation; governance

1 Introduction

To appropriately manage current and projected climate risks, discussions have focused on the possible need to supplement incremental approaches to adaptation with transformative strategies (Kates *et al.*, 2012; O'Brien, 2012; Pelling *et al.*, 2015). Transformation is often characterized by non-linear changes or departure from the status quo (O'Brien, 2012; Revi *et al.*, 2014; Pelling *et al.*, 2015). It requires “*a fundamental qualitative change . . . that often involves a change in paradigm and may include shifts in perception and meaning, changes in underlying norms and values, reconfiguration of social networks and patterns of interaction, changes in power structures, and the introduction of new institutional arrangements and regulatory frameworks*” (IPCC, 2012, p. 465). It is generally purported that transformational change differs from, or may even be the opposite of, incremental change in terms of depth, scope and speed of change (Termeer *et al.*, 2016); certain conceptualizations of transformation indicate that it is underpinned by innovation e.g. in governance, encouraging a questioning of assumptions or consideration of a problem from a different perspective, including challenging embedded technical or institutional practices or social values (Loorbach *et al.*, 2008; Hedrén and Linnér, 2009; Pelling, 2011; IPCC, 2012; IPCC, 2014). However, it has also been argued that this dichotomy may be unfruitful and conceptually as well as practically unhelpful. Termeer *et al.* (2016) for instance maintain that those elements characterize both forms of adaptation and vary in relation to circumstances and context. Thus, distinguishing between incremental and transformative change can prove difficult in practice (Kates *et al.*, 2012).

Research has recently focused on barriers that may hinder progress towards adaptation, with much work focused on climate change. A barrier to adaptation is defined as an obstacle to specified actions, for specific actors in a particular context, emerging from a condition or a set of conditions. Barriers can be experienced differently by different actors and can be overcome in principle, and are distinct from adaptation limits (Eisenack *et al.*, 2014) i.e. thresholds beyond which features of a system cannot be maintained even in a modified fashion (Moser and Ekstrom, 2010; Barnett *et al.*, 2015).

Some scholars suggest that barriers to transformative adaptation are likely to be different and more challenging than those related to incremental strategies (Moser and Ekstrom, 2010). Others attest that barriers to transformation do not differ substantially from adaptation barriers, with ambiguities concerning risks and benefits, perceived costs of change, and institutional and

behavioral inertia characterizing both incremental (Biesbroek *et al.*, 2013; Moser, 2014; Wilson, 2014) and transformative change (Rickards and Howden, 2012; Kates *et al.*, 2012). Consequently, the literature has tended to view barriers to transformation as an extension of incremental adaptation and largely ignored how and why barriers to transformations emerge and how these may be overcome. These are the foci of this paper.

Barriers to (incremental) adaptation arise from multiple and sometimes inter-related aspects and are generally classified into four broad categories outlined in more detail below: i) social and cultural; ii) institutional and governance; iii) resource; and iv) physical or natural barriers (Arnell and Charlton, 2009; Moser and Ekstrom, 2010; Jones and Boyd, 2011; Adger *et al.*, 2013; Biesbroek *et al.*, 2013; Klein *et al.*, 2014; Barnett *et al.*, 2015; Lawrence *et al.*, 2015; Juhola, 2016; Keskitalo *et al.*, 2016).

1.1 Social and cultural barriers

Social and cultural barriers can emerge in response to pre-existing worldviews, perceptions of risk, beliefs, values and preferences that underpin the ways individuals and societies experience, understand and respond to climate change (Lorenzoni and Hulme, 2009; Armah *et al.*, 2015). Jones and Boyd (2011) found that socially and culturally embedded characteristics reinforce internal community structures to resist undesired adaptation. Research also suggests that barriers vary according to place (Armah *et al.*, 2015). Culture may act as a mediating influence in resisting environmental change, particularly where change is perceived to threaten sense of belonging and place attachment (Adger *et al.*, 2013). The latter has been found to impede pro-environmental behavior in certain circumstances (Gifford, 2011) and facilitate it in others (Devine-Wright, 2009; Scannell and Gifford, 2010), and may serve to support incremental strategies but act as a constraint to transformation. Marshall *et al.* (2012, 2013) and Marshall and Stokes (2014) found that values of identity and place acted as significant barriers to transformative capacity in the Australian agricultural industry (see also Fleming *et al.*, 2015). Where strong attachment to place exists, individuals are likely to assess transformative change as a threat to place identity and may resist unwanted change (Devine-Wright, 2009; Anton and Lawrence, 2016).

For individuals with a comfortable lifestyle the desire to maintain stability increases, particularly where demand for change is externally proposed and initiated (Gifford, 2011). Therefore overcoming barriers may require disruptive events to initiate change such that social

values that constrain adaptation are transformed in the process (Fresque-Baxter and Armitage, 2012; Klein *et al.*, 2014; Barnett *et al.*, 2015). However, disruptive events which are poorly managed may serve to reinforce prevailing discourses and prevent deep structural changes from occurring (Jeffers, 2013a). Thus, the manner in which disruptive events are initiated, framed and managed is equally critical in addressing potential adaptation barriers.

1.2 Governance and institutional barriers

Institutions play a key role in facilitating or preventing adaptation through legal and regulatory responsibilities and authorities (Klein *et al.*, 2014). Measham *et al.* (2011) suggest that institutional factors such as competing agendas and leadership can constrain adaptation depending on how each is utilized. Such barriers are not solely confined to climate adaptation with incompetent leadership, lack of political will, public apathy and competing policy agendas typified across a range of complex issues and processes (Biesbroek *et al.*, 2011). Inertia within institutions means that current decisions are often underpinned by historical legacies (Burch, 2010a; Ekstrom and Moser, 2014; Klein *et al.*, 2014; Wilson, 2014; Barnett *et al.*, 2015), and may impede transformative responses (Craig, 2010). Perceived fairness, equity and transparency of governance processes relates to the legitimacy and acceptability of outcomes (Paavola and Adger, 2006), and ultimately whether public support for, or opposition to, those outcomes ensues (Gross, 2007). Several scholars have argued that transformative adaptation may demand greater perceived procedural equity (Bahadur and Tanner, 2012; Mustelin and Handmer, 2012), and a re-structuring of historically embedded path-dependent institutional structures, organizational cultures and policy-making procedures (Burch, 2010b). This necessitates leadership from key decision-makers and commitment to genuine reflection and renewal, adopting practices that are perceived as equitable and transparent to overcome obstacles in adaptation processes in order to achieve acceptable outcomes (Burch, 2010a; Adger *et al.*, 2016).

In these processes, the value of various knowledges and expertise is becoming increasingly important. Freire (2000) argues that meaningful engagement is essential in any process requiring transformative change. However, including a broad range of views in decision-making raises significant challenges where power relations can constrain meaningful participatory processes (Few *et al.*, 2007). In the context of transformative change, achieving this balance may be particularly difficult owing to diverse views, and the greater significance

typically ascribed to scientific and/or technical knowledge and expertise over local knowledge in decision-making (Kristjanson *et al.*, 2009).

1.3 Resource-based barriers

These are barriers concerning technological, human and financial constraints (Moser and Ekstrom, 2010; Klein *et al.*, 2014). Whilst such barriers are considered a significant hindrance to adaptation generally, Ekstrom and Moser (2014) highlight that these barriers to adaptation are less dominant than typically assumed. Furthermore, a lack of financial, technical or human resources does not necessarily infer a need to build greater capacity but demands that such resources are better utilized to overcome barriers (Burch, 2010a; Biesbroek *et al.*, 2011). Whilst transformative change demands significant resource investment (Rickards and Howden, 2012), some argue that resource-based barriers hindering transformation should be more critically examined in light of social and institutional barriers that may require support to facilitate undergoing changes (Grothmann and Patt, 2005; Jantarasami *et al.*, 2010; Ekstrom and Moser, 2014).

1.4 Physical barriers

Barriers emerging from physical features of the environment are considered difficult to overcome in practice although technological innovations may assist in these endeavors (Ekstrom *et al.*, 2011). Physical barriers also have implications for adaptation where path dependency linked to historical modification of the physical environment, including the siting of past infrastructural developments, may potentially constrain the range of options available (Klein *et al.*, 2014). Physical barriers can be related to both non-climatic (e.g. geology or land availability/topography) and climatic factors (e.g. effects of temperature rise).

Although each of the aforementioned barriers are distinct, barriers often occur interdependently rather than in isolation of one another, leading to interaction between, and reinforcement of, particular barriers (Eisenack *et al.*, 2014). Many barriers evolve over time (especially social ones), are amenable to change, and may be overcome with sufficient social and political support, resources and effort (Adger *et al.*, 2009; Biesbroek *et al.*, 2013), leadership, creative management, innovative thinking, prioritization, alterations in resource allocation, land use planning and facilitative institutional structures (Moser and Ekstrom, 2010).

To date there remains little empirical evidence revealing how and why barriers emerge in the context of transformative adaptation or if barriers to transformative change are similar to those associated with incremental adaptation. We address these questions by analyzing barriers to transformative change using two Irish case studies. In both, transformative flood risk management strategies were proposed but were not implemented. We systematically investigate barriers that arose within the context of each case study and suggest strategies that may help to circumvent these barriers in the future. The remainder of the paper is structured as follows: section 2 details the case studies and methods employed. Section 3 presents the primary findings of the research. We then discuss these in section 4, with conclusions presented in section 5.

2 Methods

2.1 Background and case studies

We focus on flood risk management in Ireland to explore barriers that ultimately led to the failure of different transformative strategies in two communities. The two case studies presented, namely Clontarf, County Dublin, and Skibbereen, County Cork, offer contrasting perspectives regarding the notion of transformative adaptation and illustrate how transformation is perceived and acted upon in different circumstances. Both case studies are situated within the wider landscape of flood risk management in Ireland, which is highly centralized, with the national flood authority, the Office of Public Works (OPW), the lead agency responsible for coordinating and executing government flood risk policy. The dominant approach to addressing flood risks nationally remains centered on technocratic, structural relief measures (Jeffers, 2013a; Devitt and O'Neill, 2016), despite State recognition over a decade ago that continued reliance on structural measures alone was unsustainable and a shift to non-structural solutions was necessary (e.g. land use planning, early warning systems, potential wetland restoration and recreation) (Office of Public Works, 2004).

2.1.1 Skibbereen

Skibbereen is located in south-west Ireland and has a population of approximately 2,500 inhabitants. The town is a gateway to the south-west of the country, one of Ireland's largest tourist regions and is situated in the environs of the river Ilen (Figure 1). Following extensive flooding in 2009 a local environmental group proposed the construction of a multi-functional environmental park on public land on the town's periphery to alleviate flooding. The group

proposed that the park's design and development would integrate both structural (including flood embankments) and non-structural measures (including storage retention features such as marshlands, wetlands and flood attenuation ponds). The concept was also developed to provide significant recreational and environmental benefits linked with tourism in the region and was to be the first park of its kind in Ireland in terms of its multi-functionality in integrating both structural and non-structural flood measures and recreational facilities. Drawing on IPCC (2012, 2014) definitions the case study is transformative on the basis that its realization required a fundamental change to the value systems and the institutional practices that have heretofore defined how flood risks are managed in Ireland. Several barriers to its development emerged during the process and structural flood defenses are now being pursued to protect the town from flooding. A chronology of the main events related to flood risk management in this case study is provided in Figure 2.

2.1.2 Clontarf

Clontarf is a suburban coastal community located approximately 6 km from Dublin city center with a population of approximately 31,000 inhabitants. The town is bordered to the east by the Irish Sea and to the south by the River Tolka. The area is noted for its scenic qualities and recreational opportunities. A 3 km coastal promenade is highly utilized as a recreational area and attracts a large number of visitors daily (Figure 1). Following coastal flooding in 2002 a detailed analysis was undertaken to determine areas of the city exposed to tidal flood risks, in which Clontarf was identified as particularly vulnerable (Royal Haskoning, 2005). In response, the local authority, Dublin City Council (DCC), proposed constructing an earthen mound through the center of the promenade and erecting flood walls at several locations along its course. The proposed height of the defenses ranged from 0.85 m to 2.75 m. In 2011, community groups raised significant objections to the scheme and were influential in compelling DCC to revisit proposals, organizing a public protest to illustrate opposition which was attended by approximately 5,000 people. In the context of IPCC (2012, 2014) classifications the proposal is deemed transformative in that its completion would fundamentally alter existing social values and norms ascribed to the promenade and its functionality from a community perspective. A detailed timeline of events is provided in Figure 3.

2.2 Conceptual Framework

There is no single accepted conceptual framework through which barriers to adaptation are either categorized or assessed. Instead, most authors develop case-appropriate frameworks to

understand barriers to adaptation (Jones and Boyd, 2011; Lehmann *et al.*, 2013; Mersha and Laerhoven, 2016; Uittenbroek, 2016). We chose to adopt the framework of Moser and Ekstrom (2010) to assess barriers to transformation. This diagnostic framework provides indicative steps through which to identify barriers that may hinder adaptation processes and includes a matrix that encourages classification of the barriers according to their origins relative to the location of the actor(s), with a view to considering how they may be overcome. The temporal dimension enables differentiation between contemporary and legacy barriers, although this can be difficult in practice given their interrelatedness (Ekstrom *et al.*, 2011). The spatial/jurisdictional dimension helps distinguish proximate versus remote barriers. Taken together, they provide a means to assess where and what type of intervention is required and who is best positioned to address a given barrier (Mukheibir *et al.*, 2013).

This framework has been adapted and applied to assess barriers in varied studies (Uittenbroek *et al.*, 2012; Mukheibir *et al.*, 2013; Archie, 2014; Ekstrom and Moser, 2014) as a systematic way to identify, focus and reflect upon barriers and adaptation processes, and create opportunities for deeper consideration of key aspects related to facilitating adaptation. Despite suggestions that transformation may encounter different and more challenging barriers than incremental adaptation (Moser and Ekstrom, 2010), where research on transformational adaptation exists barriers have not deviated from those identified in the literature for adaptation more generally (Olsson *et al.*, 2010; Kates *et al.*, 2012; Marshall *et al.*, 2012; Marshall *et al.*, 2013). Consequently, we test whether this framework offers a useful approach to diagnose barriers to transformative adaptation and identify how these could be overcome.

2.3 Data Collection and Analysis

Semi-structured interviews were conducted with fourteen key stakeholders between July and November 2015. This comprised interviews with five stakeholders in Skibbereen, eight in Clontarf and one interviewee employed with the OPW. Participants were purposively selected based on their involvement in the proposed strategies or their knowledge of flood risk management practices nationally. Interviews lasted between 1 and 2.5 hours, were recorded with participants' permission and transcribed verbatim. In reporting results, gender appropriate pseudonyms are used to preserve participants' anonymity (Table 1).

Interview transcripts were coded using MAXQDA 12 software to examine dominant themes between and within transcripts. Themes were created using an iterative approach, which was

cognizant of prior themes, whilst also drawing on analysis grounded in the transcript data, thus combining both inductive and theoretical thematic analysis (e.g. Braun and Clarke, 2006). Thematic analysis involved coding of the transcript data according to the four categories of barriers identified in the literature review (social/cultural, governance/institutional, resource and physical). Based on the work of Glaser and Strauss (2009) a grounded theory approach was utilized to take account of additional information emerging during interviews following the assumption of Moser and Ekstrom (2010) that barriers to transformation are likely to differ from those identified in the adaptation literature more generally. Barriers were then independently assessed by a second author to ensure inter-rater reliability and rigor of the initial coding. An in-depth review of policy documents pertaining to flood risk management nationally was also conducted in addition to a detailed assessment of grey literature and publically available material for both case studies to help interpret findings within a broader context.

3 Results

Data analysis primarily highlight social/cultural and institutional barriers in both case studies which emerged at different times within the adaptation process (Table 2). These relate to emotional attachment to place, place identity and historic care for the environment (social/cultural - Section 3.1), reliance on technical expertise (institutional – Section 3.2.1), and regulatory procedures (institutional – Section 3.2.2). Notably, across both cases some resource-based constraints were associated with institutional dependence on technical expertise (Section 3.2.1).

In Skibbereen, barriers emerged during the planning phase, whilst in Clontarf they emerged during implementation (and are of the three types identified above). Drawing on the Moser and Ekstrom (2010) framework institutional barriers can be categorized as remote/legacy having occurred as a result of historic decisions, some of which were outside the control or influence of current actors. By contrast, social/cultural barriers can be characterized as proximate/contemporary-legacy issues, being within reach of an actor's sphere of control and therefore potentially malleable to change but stemming from past actions and decisions. Each of the three groupings of identified barriers are now discussed with reference to the specific case study context.

3.1 Social/cultural barriers

Place attachment and place identity in Clontarf

In Clontarf, barriers emerged when community groups became aware of the flood defense proposals in 2011, four years after public consultation had been completed (Figure 3 timeline). Proposals by the local authority to significantly alter the promenade to incorporate flood defenses were vehemently resisted by local community groups representing residents and businesses and by elected representatives. Emotional connection to the promenade, its value as a recreational amenity and its proximity to the coast were frequently suggested as key reasons for this attachment:

Julie: *“The first thing that you have to know about people from Clontarf is that they firmly believe that they live in the best place in the world. Everybody who lives in Clontarf thinks that they live in the best place in the world, which is a lovely thing. They are very attached to that prom and rightly so because it’s a great amenity.”*

Elaine: *“You have this beautiful natural setting, and when you’re down on the prom here you could put so many things out on the water.”*

Keith: *“If you come down here at the weekends or any day of the week you will see people out walking, you see people out jogging. It’s a lovely promenade.”*

Alice: *“I think what another wonderful outcome was that, and as if we needed it, we all fell in love with the prom even more. I’m quite conservative about the swanky outcome because I think it needs just tiny little touches to make it that much more of a wonderful place.”*

The promenade, its recreational features and the natural coastal setting were considered to epitomize people’s understanding of what Clontarf meant and how people identified with the place (Clontarf.ie, 2011b; Dublin City Council, 2011; O’Carroll, 2011). The proposed flood defenses were deemed to create a physical barrier between the community and the coast, which it was suggested would result in a decline in usage of the promenade. This would serve to “steriliz[e] the prom” as one interviewee commented, thereby limiting its uses. Severing the community’s connection with the promenade was deemed to threaten place identity and sense of belonging in the process:

Alice: *“It is a magic place and when we walked with [. . .] and his colleagues along the prom and it was a lovely day and we have the working group there . . . it was lovely that they were doing a field trip and appreciating what we love about it. I wouldn’t want to change it too much more.”*

Julie: *“In many ways it’s [the promenade] a better amenity than the equivalent in Dun Laoghaire or other coastal parks because it is such a large grassy facility . . . parts of it are iconic. Those green structures, the ones that are ionized, if you put them somewhere else there would probably be a protest but they’ve become iconic, they have become Clontarf and it’s the same for the prom. It’s intrinsically wedded in peoples’ minds in . . . their idea of where they come from.”*

Historic community opposition against unwanted developments in Dublin bay that were perceived as impacting the community’s connection to the landscape (Clontarf.ie, 2011b; Department of Housing, Planning, Community and Local Government, 2015) was noted as a key reason for the community’s opposition by an elected representative:

David: *“The port company were going to fill in 52 acres of land and there has been a big fight down there – it’s been going on for the last 20 years or so, so there has been a tradition of fighting for that bay down there.”*

Illustrating the desire to preserve intra and inter-generational attachment, the promenade’s importance as an amenity was deemed to extend beyond the environs of the community (Anon., 2011; Clontarf.ie, 2011a), with several interviewees describing the community as its “gatekeepers”:

David: *“The people that live on the [sea]front, even they would see themselves as keepers of the environment there.”*

Keith: *“This amenity [promenade] is for everybody, not just Clontarf.”*

Elaine: *“The way people responded in terms of how they saw the value of the amenity . . . as a national and city amenity, but they did not necessarily see it as a local amenity.”*

Despite ongoing flood risks, the interviews highlight that protection of the form and functionality of the promenade was of primary importance, whereby the community did not wish changes to interfere with their attachment to the landscape nor impinge on their sense of connection to the area. The significance of emotional attachment and place identity served to solidify the community's position in opposing flood defenses which would transform the landscape and threaten their connection to it.

3.2 Institutional barriers

3.2.1 Reliance on technical expertise – insights at national level from Skibbereen and Clontarf

Despite a Flood Policy Review over a decade ago recognizing that a move to non-structural approaches was needed (Office of Public Works, 2004), Irish national discourse remains focused on hard engineering solutions to flood risk. The institutional practices and the mind-set of those with responsibility for flood risk management have not shifted in the intervening period to incorporate non-structural measures as was exemplified by an official from a local authority when discussing the authority's primary means of developing flood relief solutions:

Gareth: "I don't see any point in putting something in that has to be removed in 40 or 50 years. If it's not designed that you can put something else in front of it and make it higher, it's very difficult to retrofit it. Also, the OPW . . . don't want to go back because it's much more costly to do it twice . . . they just want to go in and do something once that's going to last the design life of the structure."

Difficulties with implementing non-structural flood relief measures were evident in the context of budgetary resources allocated for both structural and non-structural flood relief measures following the Flood Policy Review in 2004, with an investment of €26m recommended for non-structural measures over a 6-year period compared to €440m for structural flood relief projects over a 10-15 year period (Office of Public Works, 2004). Current practices continue to favor structural flood measures with the national government allocating a further €430m for structural flood defenses for the period 2016-2021 (Office of Public Works, 2015). This institutional mind-set was evident in Skibbereen in the context of the local flood committee's support for structural measures as the only practical means of responding to flood risks in the town. The influential role of the flood committee in representing the flooded community, and

committee members direct experience of flooding, served to solidify these practices. Structural flood defenses were described as a “*total solution*” to the flooding problem by one flood committee member and the failure to consider alternatives signified their overriding preference for engineered flood relief measures:

Colm: *“Even if you’re talking about putting in whatever type of water park you were putting in there you can’t do that until such time as the flood defense solutions are put in to protect the town and you can’t have any half flood defense systems to blend in with a water park. The water has to be stopped going into the town full stop.”*

Barry: *We haven’t got . . . a definitive plan of where every wall and where every embankment and where every pumping station and where every non-return valve is going to be [for the approved defenses], so . . . the point I’m making is that [environmental park] wouldn’t stand the fool proof test. The fool proof plan is huge.*

Preference for structural solutions was directly linked to concerns relating to non-availability of flood insurance. A Memorandum of Understanding between the OPW and the representative national insurance body, in which permanent flood defenses were deemed a fundamental prerequisite by the insurance industry in providing flood insurance, appear to have influenced the flood committee’s position (Office of Public Works, 2014; Insurance Ireland, 2015; Hilliard, 2016). Whilst demountable flood defenses are deployed in limited circumstances nationally, flood authorities are reluctant to utilize this option owing to risks associated with human intervention each time a flood risk occurs and the exclusion of flood insurance for properties in areas where demountable defenses exist (Insurance Ireland, 2015). Subsequently, committee members argued for flood insurance, believing that structural flood defenses were the most effective way of increasing the likelihood of insurance companies re-instating flood insurance:

Matthew: *“Because we don’t have flood insurance the value of our properties are worth nothing.”*

Barry: *“The big concern for communities like us is the restoration of insurance. It’s an issue at government level with the insurance federation that they are very slow to restore full or even partial cover until such time as the risk is gone. What really copper fastens our mandate from*

the 230 businesses and residents is that practically none of them [can] get insurance so that's what's driving us."

Moving to a system which integrates even relatively small-scale non-structural approaches to flood risk management practices was deemed to be a significant challenge at an institutional level. Whilst support for greater integration of non-structural solutions exists, the lack of familiarity with these measures in comparison to traditional solutions makes such strategies increasingly difficult to evaluate and justify as was exemplified by an official from the national flood authority:

Martin: "If the situation arose that we could create a storage area that could be used as some kind of an amenity or create some biodiversity value and that storage area would provide flood risk reduction that we need then that's fine, we can put that forward as a measure. It's just that the cases that arises in would be few. We haven't really come across it to date."

Thus, the results from Skibbereen demonstrate that rather than perceiving non-structural strategies as the default strategy around which structural flood relief measures could be designed, the opposite appears to be true.

In Clontarf, elements surrounding technical barriers to change were also evident. Those with a strong technical background were deemed to be responsible for designing the proposed flood defenses (Clontarf.ie, 2011c; Dublin City Council, 2011), a point which was re-iterated by interviewees. This resulted in a solution which, whilst the community acknowledged would be effective at preventing flood risks, did not take into account other concerns and knowledge:

Elaine: "We asked for a multidisciplinary team. We said that we did not consider this as an engineering project and even if something is engineering led . . . it should never be just the engineers."

Dorothy: "It was definitely an engineering job with no other department involved."

Institutional practices of prioritizing engineering knowledge and approaches in decision-making were heavily criticized by the community (Clontarf.ie, 2011c; Dublin City Council, 2011; McGrath, 2011). One interviewee contended that this practice was no longer legitimate

in its own right given the increasing complexities associated with climate change and the potentially adverse implications adaptation strategies may have on society.

Gabriel: *“As my engineer friend said, “it is a personality trait of engineers. Look you asked for a solution. We’ve giving you one” and that’s perfectly understandable. It’s a logical brain . . . but we live in a different time now – we live in a time where we have to be sympathetic to the environment and it’s a very serious issue, flooding and climate change . . . that engineer would have left a disaster behind him in our eyes.”*

An elected representative suggested that engineers were less likely to be connected to, and therefore understand, the concerns of local communities when designing flood relief schemes compared to politicians who could be held publically accountable, with another stating that this compartmentalized thinking was no longer justified and that genuine engagement with affected communities was needed for adaptation strategies to be considered legitimate:

Julie: *“Engineers are not politicians. They don’t understand the political sensitivities of messing with a promenade like the one in Clontarf . . . it’s because I suppose they are not politicians, they don’t have to go back to people, they are not going to be personally emailed and they think that in the end when the finished product is there that people will be happy with it.”*

David: *“The engineers in my opinion, they really have to buy into it [consultation]. It’s a feeling that you get that these people are really listening to you and that they are really taking on board what you are saying.”*

The importance of integrating local knowledge and viewpoints emerged as a key priority at a local level, resulting in the local authority abandoning plans to proceed with the flood relief scheme in 2011. Following extensive discussions between the local authority and community groups in the aftermath of this decision the community negotiated the inclusion of two of its representative bodies in a multi-disciplinary consultation group established to identify alternative flood relief options for the area; discussions are ongoing (Figure 3).

3.2.2 Regulatory practices from Clontarf

A significant barrier to adaptation in Clontarf centered on planning regulations, specifically those regulations detailing how the public is notified of major infrastructural projects being

undertaken by local authorities. Under EU Directives regarding public participation in environmental decision-making (Council Directive 2003/35/EC) and Part 8 of the Planning and Development Regulations (2001) local authorities are required to place a notification of major infrastructural projects in an approved newspaper and to erect notices on the land on which the proposed development is to be sited. Julie, an elected official, described these methods as “stone age” and as not reflecting modern means of communication. This, it was suggested, acted as a primary reason for a lack of community awareness and engagement with the issue until 2011, four years after public consultation under the scheme had passed:

Julie: “I think the whole Part 8 process should be looked at. We have social media now. We have an awful lot of different ways that we didn’t have in the past of getting the message across to people to avoid these kind of things happening. We need to use that better and we need to update the Part 8 process and take account of new technologies. I think the barriers to having people engaged is rooted in the outdated communication process for the whole Part 8 procedure.”

Effective communication strategies and the means of disseminating information about proposed flood relief schemes were also highlighted as a primary concern by officials with responsibility for flood risk management:

Gareth: “I think communications is the big element of it. A scheme is proposed . . . but getting the message to people who it’s going to affect and you don’t really know who they are. With flooding you know the people that have been flooded but then you have the people who use a certain facility and they may be miles away or they might drive by there every day. How do you tell all of them what’s proposed? . . . It’s really communication I feel is the toughest thing to achieve.”

Martin: “Some communities . . . have active flood groups. They may have a flood and some residents and businesses would have come together . . . and they would be quite proactive about that engagement. I think that would be more the exception than the rule.”

The governance process and how decisions were arrived at in relation to the proposed defenses in Clontarf were highlighted as a significant concern by the community. David, an elected official, commented that the public consultation process was merely “ticking a box” to the

extent that the local authority was not considered as genuinely interested in community engagement. The community expressed concerns with a number of issues pertaining to public consultation and suggested that it was illegitimate having taken place in areas distant from Clontarf (Clontarf.ie, 2011a; Ó Ríordáin, 2011), which subsequently contributed to a lack of local awareness until after the public consultation process had ended. This breakdown in communication ultimately led to a loss of trust between parties as was noted by several interviewees:

Gabriel: *“The public consultation was done at a big remove from this area. It was done in libraries in Marino and places like that a number of kilometers away, and that immediately gave us ammunition to say “you’re hiding something”. The real failing . . . was that the information that they [Dublin city council] gave to the residents of Clontarf . . . was not properly communicated . . . and Dublin city council today would freely accept that that was the case.”*

David: *“They [Dublin city council] never really bought into the public consultation.”*

Keith: *They [Dublin city council] deliberately ignored us and tried to ram it through. People were shocked at the arrogance of the council that this was pushed through without any consultation.”*

Despite repeated concerns from some interviewees that the local authority was not transparent in notifying the public of the flood relief scheme in Clontarf, it met all statutory requirements relating to public notification and consultation. Statutory methods of communication used for notifying the public of such infrastructural projects do not appear to have been conducive to effective public engagement and had consequential impacts on community perceptions of the governance process. Results highlight that institutional issues with planning regulations were one of the main causes of residents’ opposition and created a lack of trust over how the governance process was managed.

The results point to the context-specific challenges of implementing transformative adaptation. As demonstrated in Clontarf latent social values surfaced in response to perceived threats to a valued place and created resentment towards the authority imposing these changes. Furthermore, processes associated with public engagement and communication practices led

to these being perceived as mismanaged and illegitimate by the community. Additionally, in both locations barriers to transformation arose from historically-embedded practices prioritizing technical experience and decision-making processes at the expense of other forms of knowledge.

4 Discussion

Our analysis suggests three primary factors played a role in creating barriers to transformative change across both case studies, namely threats to emotional place attachment and place identity, use of technical expertise and regulatory procedures. Within those institutional barriers that emerged, we also identified resource-based constraints to transformation. Whilst physical barriers to adaptation can also emerge, we found little evidence of such barriers prohibiting transformation in both case studies. In the context of this research at least, physical barriers were overshadowed by more prevalent social and institutional constraints.

These barriers do not differ substantially from those already identified in the literature more generally, despite suggestions that transformative adaptation barriers may differ to those of incremental adaptation (Moser and Ekstrom, 2010). We found the Moser and Ekstrom (2010) framework useful in classifying these barriers, enabling further reflection on their origins and potential ways of overcoming them. We now discuss each of the identified barriers and suggest strategies to move towards transformative pathways based on the temporal-spatial origin of each of the barriers (Table 2).

4.1 *Place attachment and identity as barriers to transformation*

Connection to the natural landscape is related to societies' proximity to the physical environment (Adger *et al.*, 2009), and may act as a barrier to transformative change where sense of place is threatened (Marshall *et al.*, 2012). Our findings for Clontarf exemplify this point. Although it has been argued that cultural values change as societies react and adjust to changing conditions (Adger *et al.*, 2009), demands for large-scale transformations are likely to pose a significant challenge in terms of societies' ability and willingness to adapt (O'Brien, 2009). This appeared to be particularly evident in Clontarf given historic community values concerned with protecting the local environment, and supports the contention that socially embedded values strengthen internal community structures to oppose unwanted adaptation (Jones and Boyd, 2011).

Recent research argues that communities will continue to pursue incremental low-regrets strategies until they experience significant extreme events that increase the salience of climate change impacts (Markell, 2016). Specific events have the potential to turn incremental adaptation into transformative change when social thresholds are passed (Adger *et al.*, 2013). This raises an important point. Where climate change becomes tangible, it amplifies societal demands for action (Adger, 2016), and as weather-related hazards increase under a changing climate, values ascribed to places are also likely to shift in response to experience associated with such events (Olsson *et al.*, 2006). Consequently, it may only be when places are disrupted that attachment to place becomes disrupted (Anton and Lawrence, 2016), resulting in individuals taking adaptive actions to protect their infrastructure and livelihoods (Hess *et al.*, 2008). Interestingly, the last major flood event in Clontarf occurred in 2002, which may have led to complacency over the risks posed by flooding; flood defenses are now being co-developed by the community and local authority.

Research suggests that proximate barriers are more malleable to change if they are more within an actor's (or several actors') control (Moser and Ekstrom, 2010). Findings from Clontarf question this, demonstrating that where social values associated with place are concerned, the proximity of a barrier to an actor's sphere of influence is unlikely to be a useful indication as to whether a barrier can more likely be overcome. Where societies ascribe strong values to the physical environment a re-alignment of values is likely to take considerable time and effort to achieve. Altering such values can be difficult within the relatively short timescales under which adaptation strategies are often planned and implemented. Whilst large-scale, once-off transformative change may continue to be vehemently resisted by communities owing to current social values as illustrated in the case of Clontarf, the sum of a series of (incremental) adaptation strategies may coalesce into something which is retrospectively considered as transformative over a longer timeframe (Pelling, 2011; Smith *et al.*, 2011; Kates *et al.*, 2012; Burch *et al.*, 2014). We argue that low-regrets strategies that are sufficiently robust and flexible, that take account of changing values over time, are cognizant of local knowledge capacities and are negotiated with communities, are more likely to overcome societal resistance and facilitate transformative change over time.

4.2 Technical expertise as a barrier to transformation

Our findings point towards the prominence of engineering knowledge and approaches in flood risk management, which acted as a significant barrier to transformative change in the context of both case studies. This was evident in Skibbereen in the flood committee's support for structural flood defenses due to issues related to flood insurance provision. Similarly, the prevalence of traditional engineering knowledge and approaches served to reinforce community opposition against unwanted flood defenses in Clontarf.

Recent research highlights the importance of strong informal institutions in challenging rigid formal institutions to move towards transformative adaptation (Pelling *et al.*, 2015), with extreme events providing a space for social transformations to occur (Pelling and Dill, 2010). However, societal preference for technical responses in the immediate aftermath of severe flooding constrains consideration of non-structural alternatives (Devitt and O'Neill, 2016). That a technocratic option was considered as the only legitimate solution to solving flooding by the community's flood committee in Skibbereen is demonstrative of broader institutional flood risk management practices nationally which are deeply tied to structural flood relief measures, an issue which is compounded by a distinct lack of financial resources allocated to non-structural flood relief measures. Moreover, institutional practices which continue to prioritize structural flood relief measures create a positive feedback mechanism whereby technical skills and expertise are considered a panacea for managing flood risks nationally, thus preventing alternative forms of human capital from informing decision-making processes. This supports the contention that resource-based constraints hindering transformation should be more critically examined with respect to underlying institutional practices (Jantarasami *et al.*, 2010; Ekstrom and Moser, 2014). Furthermore, it illustrates the interconnected and compounding nature of barriers (Eisenack *et al.*, 2014) in terms of the effect policies and practices have on decision-making in both Clontarf and Skibbereen.

The urgency of the Skibbereen flood committee in campaigning for an immediate solution to flooding prevented members from supporting an integrated option which was perceived as potentially prolonging flood risk and is further explained by concerns regarding reinstatement of flood insurance. Perceived protection of structural solutions is difficult to overcome at a societal level owing to human inertia associated with ingrained habits and preferences (Fischer *et al.*, 2011). The significance of flooding in Skibbereen in 2009 served only to reinforce these preferences. Moving to a system of flood risk management that facilitates non-structural

approaches – as recommended in the national Flood Policy Review over a decade ago – will prove challenging under current arrangements. Owing to the dominance of a neoliberal discourse within national policy and an emphasis on permanent, structural flood defenses in the provision of flood insurance, alterations to flood risk management strategies are unlikely to significantly deviate from technocratic solutions (Jeffers, 2013a; Jeffers, 2013b).

Embedding non-structural measures into flood risk management decision-making may only succeed where decisions taken are classified as ‘no-regrets’, that is, having no residual effect on the provision of flood insurance for instance, thus constraining the potential for immediate transformative pathways to flood risk management practices. Nonetheless, such options may offer opportunities for transformation over a longer horizon through shifting from traditional practices alone that facilitates the potential for remote and historic institutional barriers to be overcome in the longer term (Ekstrom *et al.*, 2011). However, it may be that changing institutional structures without transforming actors’ values and beliefs will not produce transformative outcomes (Olsson *et al.*, 2010; Mustelin and Handmer, 2012).

The findings from Clontarf also demonstrate the role of socio-technical institutional practices in flood risk management decisions. The current engineering model of understanding and managing flood risks creates significant obstacles to adaptation, and as the community’s response in Clontarf suggests, may lead to perceptions that change is being unnecessarily imposed. The evidence presented from this research suggests that only through considering successful adaptation as beyond the remit of technical solutions, and as inherently participatory and place-based, can barriers to transformation be reduced.

4.3 Regulatory practices as a barrier to transformation

Some scholars have pointed to the need to re-structure path dependent institutional structures, organizational cultures and policy-making procedures in shifting to transformative agendas (Burch, 2010b). Findings from Clontarf suggest that statutory policies related to the notification of flood relief projects are not conducive to facilitating effective governance practices, supporting the conclusions of Lehmann *et al.* (2013) that existing institutional bureaucracies and regulations impede adaptation. Research concerning transformation and sustainability management illustrates the importance of governance principles of procedural justice and transparency in reducing the risk of unfavorable transformations (Chapin III *et al.*, 2010; Mustelin and Handmer, 2012; Park *et al.*, 2012; Revi *et al.*, 2014; Pelling *et al.*, 2015). This is

particularly relevant because of resistance associated with transformative change (O'Brien, 2012). Barriers that emerged during the governance process in Clontarf are indicative of procedural justice concerns and broader institutional practices and regulations defined under national and EU legislation regarding how flood relief schemes are designed, consulted upon and subsequently communicated to the public (Council Directive 2003/35/EC; Council Directive 2007/60/EC).

Researchers have noted that inclusiveness in adaptation decision-making needs to be more than an “illusion of inclusion” (Few *et al.*, 2007). Moving beyond these barriers towards transformative agendas demands greater public awareness and engagement, facilitated by effective and transparent governance practices. As Benson *et al.* (2014) argues, and as the findings from Clontarf attest, individuals perceive participation as requiring more than conformance to statutory requirements. Transformative change is unlikely to be supported where communities perceive that they have little opportunity to participate and influence the adaptation process. The merits of statutory legislation are important in the context of managing flood risks, but used in isolation they may be insufficient to lead to acceptance of the process and subsequent outcomes where adaptation is concerned. Enacting regulations differently by tailoring communication and engagement for different stakeholders offers a practical means of overcoming these concerns. Given the inertia typically associated with larger governance structures however (Mukheibir *et al.*, 2013), any changes to historic and inflexible regulatory practices may themselves be construed as transformative and take considerable time and effort to achieve (Kates *et al.*, 2012; IPCC, 2012; Aall *et al.*, 2015).

5 Conclusion

This research sought to explore barriers to transformative change in two Irish case studies relating to flood risk applying the Moser and Ekstrom (2010) diagnostic framework. We identified three primary barriers that inhibit transformative adaptation, namely; place attachment and identity, dependency on technical expertise and institutional regulatory issues. We show how the framework serves to categorize these in relation to their temporal and spatial/jurisdictional characteristics, and illustrate potential intervention strategies where barriers to transformation emerge.

For barriers pertaining to place attachment and identity, transformative change might only be realized when extreme weather events are brought to bear. Communities may continue to favor incremental changes which do not interfere with these values until such time as sense of place is threatened from natural as opposed to anthropogenic forces i.e. threats from weather-related events rather than anticipatory changes initiated by institutional authorities. This research has shown that rather than waiting for latent social values to emerge, understanding residents' environmental perceptions towards change early in the adaptation process is crucial because it potentially impacts on attachment to place, as processes in Clontarf illustrate. Where barriers to transformation are likely to emerge, transformation may instead be achieved through a series of incremental changes, which culminate in something that is retrospectively transformative in nature. Facilitating transformation through incrementalism demands institutions and strategies that are sufficiently flexible, transparent and responsive to changing social values.

We show that institutional practices which prioritize some forms of technical expertise, and which invest resources accordingly, can also act as a significant barrier to transformation. Altering governance and institutional systems to embrace inter-disciplinary knowledge may facilitate a move from rigid path dependencies that lock-in the range of available options for future generations to more transformative agendas (Levin *et al.*, 2012; Ekstrom and Moser, 2014; Patterson *et al.*, 2015). Recognizing both the benefits and limitations of technological interventions is crucial and requires looking beyond technical solutions as the sole means of responding to flooding to exploring and understanding complex interdependencies and embracing current technologies to improve public participation opportunities.

Whilst we have used a small sample of respondents to elicit barriers to transformation, we believe the findings are robust given the richness of data in both cases. Nonetheless, the addition of quantitative research methods such as questionnaire surveys would be useful to corroborate our findings, particularly surrounding the notion of place attachment given the dearth of research on this with respect to transformative adaptation. Further empirical studies across a range of sectors where barriers to transformation emerged would also prove useful to help contextualize our findings within a broader context.

Although we explicitly examined barriers pertaining to transformative adaptation within a single sector (flood risk management) and country (Ireland), we argue that our findings have applicability for other sectors and places given the generalized nature of identified barriers.

They are particularly pertinent for agents interested in future adaptation planning where transformative change may play a greater role than at present and illustrate how transformative adaptation may be conceptualized and planned for in the long-term. The growing global demands for transformative adaptation in response to various climatic risks including flooding (IPCC, 2014), and the fact that often more is learned when processes fail than succeed, suggests that empirical analysis of barriers to transformation is not just important, but necessary, in moving the transformative adaptation agenda forward.

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Table Captions

Table 1 Details of interviewees for both case studies including pseudonyms

Table 2 Temporal and Spatial-Jurisdictional Barriers to Transformative Adaptation in Clontarf and Skibbereen based on Moser and Ekstrom (2010) framework

Figure Captions

Figure 1 Case Study Locations. Image top-right: Clontarf promenade. Image bottom-right: River Ilan, Skibbereen

Figure 2 Timeline of developments in the Skibbereen case study

Figure 3 Timeline of developments in the Clontarf case study

Table 1 Details of interviewees for both case studies including pseudonyms

Skibbereen – 5 interviewees	Clontarf – 8 interviewees	National – 1 interviewee
<ul style="list-style-type: none"> • Former local authority elected representative – not drawn upon • Flood committee members – Barry, Colm, Matthew • Previously flooded residents and business owners – Barry, Colm, Matthew • Environmental group representative – not drawn upon 	<ul style="list-style-type: none"> • Local authority elected representatives – David, Julie • Residents exposed to flood risks – Alice, Elaine • Business association member - Gabriel • Residents association members – Alice, Dorothy, Elaine, Keith • Local authority official with responsibility for flood risk management - Gareth 	<ul style="list-style-type: none"> • National flood authority representative - Martin

Table 2 Temporal and Spatial-Jurisdictional Barriers to Transformative Adaptation in Clontarf and Skibbereen based on Moser and Ekstrom (2010) framework

		Temporal	
		Contemporary	Legacy
Spatial/Jurisdictional	Proximate	<ul style="list-style-type: none"> Concern with attachment to place and historic care for environment (C) 	
	Remote		<ul style="list-style-type: none"> Inertia within flood risk management decision-making nationally: strategies constrained to technical solutions (C, S) National regulations regarding planning process deemed non-transparent regarding public participation (C)

C = Clontarf; S = Skibbereen

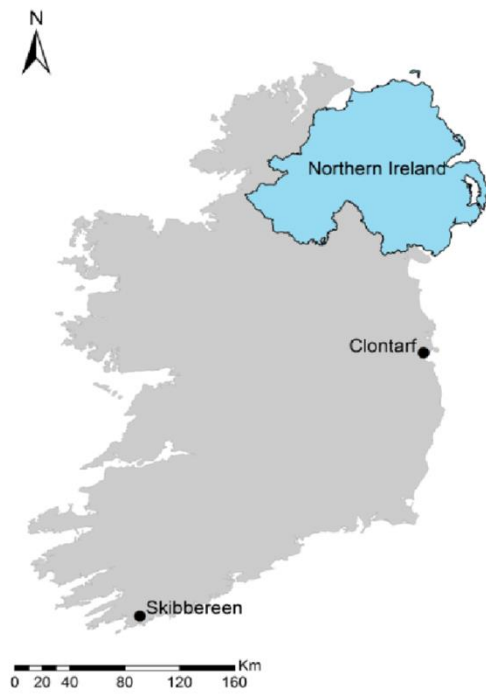


Figure 1 Case Study Locations. Image top-right: Clontarf promenade. Image bottom-right: River Ilen, Skibbereen

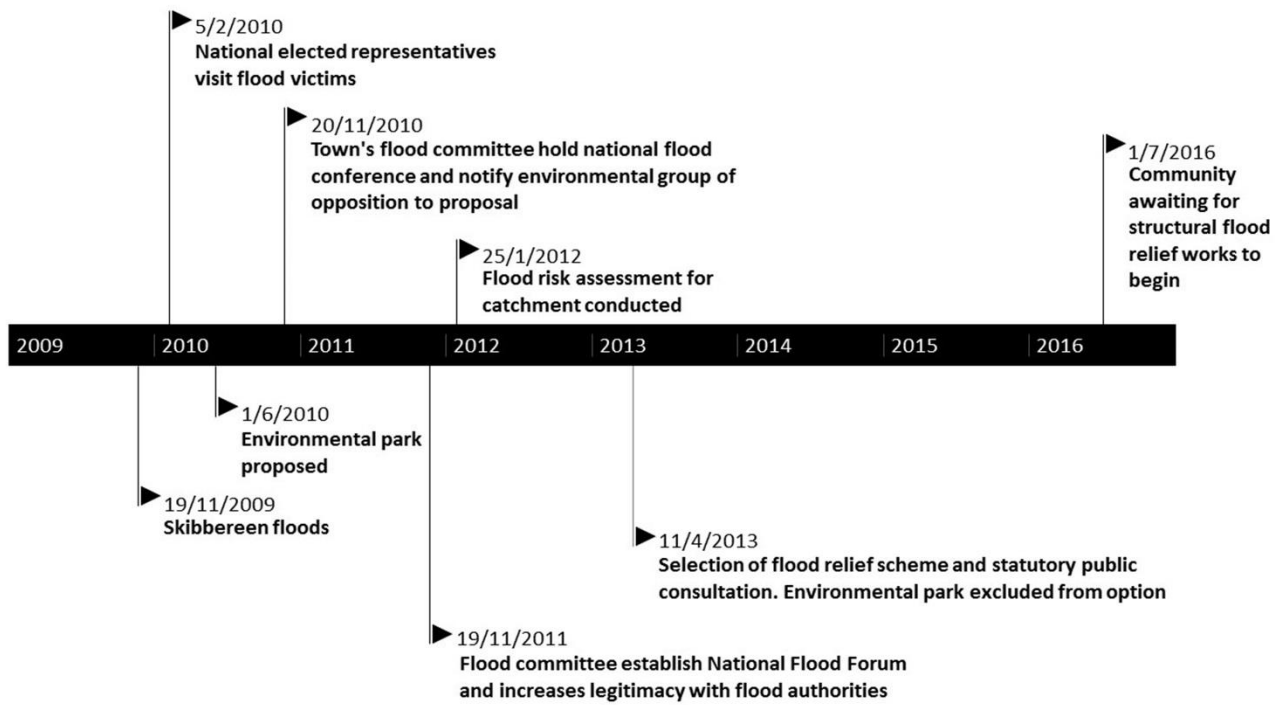


Figure 2 Timeline of developments in the Skibbereen case study

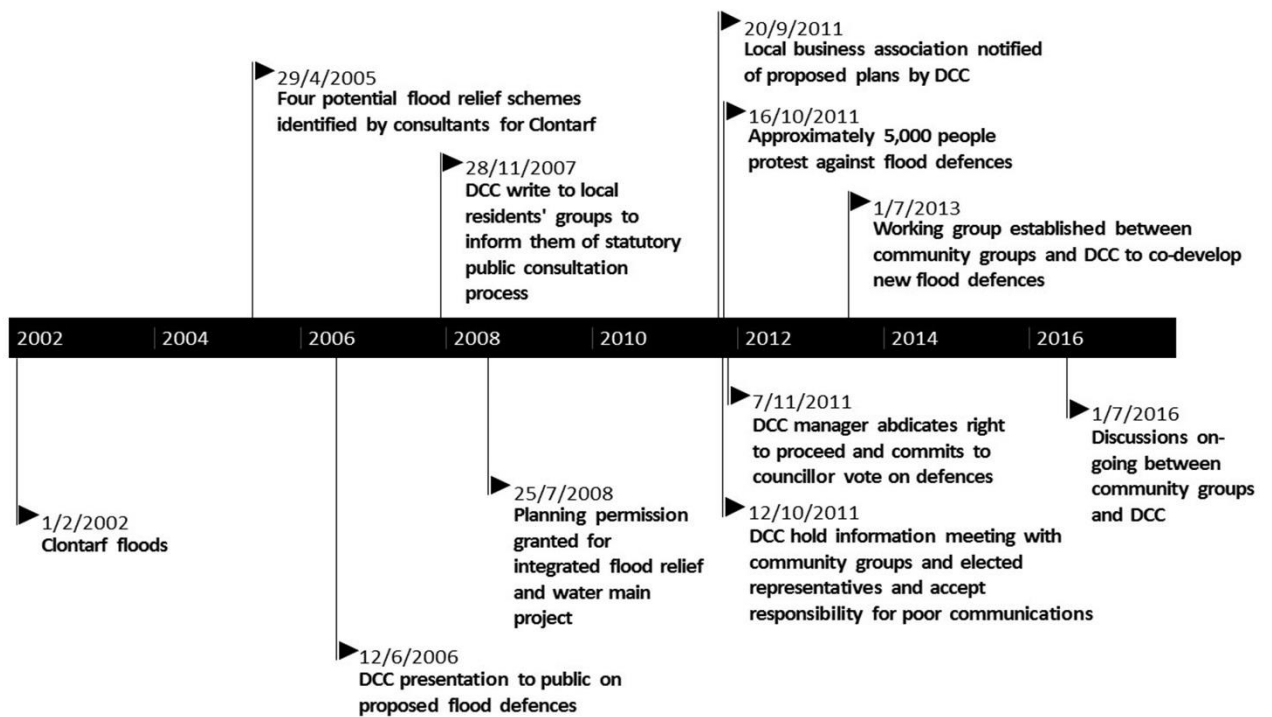


Figure 3 Timeline of developments in the Clontarf case study